

Tuberculosis in the United States

National Tuberculosis Surveillance System Highlights from 2016

Slide 1 (title slide). Tuberculosis in the United States—National Tuberculosis Surveillance System, Highlights from 2016. This slide set was prepared by the Division of Tuberculosis Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP), Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services (HHS). It provides trends for the recent past and highlights data collected through the National Tuberculosis Surveillance System for 2016. Since 1953, through the cooperation of state and local health departments, CDC has collected information on newly reported cases of tuberculosis (TB) disease in the United States. The data presented here were collected by the revised TB case report introduced in 2009. Each individual TB case report (Report of Verified Case of Tuberculosis, or RVCT) is submitted electronically to CDC. The data for this slide set are based on updates received by CDC as of June 21, 2017. All case counts and rates for years 1993–2016 have been updated.

Slide 2. Reported Tuberculosis (TB) Cases, United States, 1982–2016. The resurgence of TB in the mid-1980s was marked by years of increasing case counts until its peak in 1992. Case counts decreased from 1993 and 2014, and again in 2016. However, in 2015, a slight increase occurred in the total number of TB cases reported in the United States. From 1992 until 2008, the total number of TB cases decreased 2%–7% annually. An unprecedented decrease occurred in 2009, when the total number of TB cases decreased by more than 10% from 2008 to 2009. In 2016, a total of 9,272 cases were reported from the 50 states and the District of Columbia (DC). This represents a decrease of 2.9% from 2015, and a 65.2% decrease from 1992.

Slide 3. TB Morbidity, United States, 2011–2016. This slide provides the total number of reported U.S. TB cases and the associated rates for each of the past 6 years. Rate is defined as the number of cases per 100,000 population. The number of TB cases decreased from 10,509 in 2011 to 9,272 in 2016, and the TB rate decreased from 3.4 in 2011 to 2.9 in 2016.

Slide 4. TB Case Rates, United States, 2016. Forty-one states reported a rate ≤ 2.9 cases/100,000 population, the 2016 national average. Nine states, the District of Columbia (DC) and New York City (NYC) reported a rate > 2.9 cases/100,000 population; these accounted for 63% of the national total in 2016.

Slide 5. Map of the U.S.-Affiliated Pacific Islands, by TB Case Rates, 2016. The Federated States of Micronesia, Republic of the Marshall Islands, Northern Mariana Islands and Palau had case rates at or above 50/100,000 population. The lowest case rates were in Guam and American Samoa.

Slide 6. TB Case Rates, U.S.-Affiliated Pacific Islands, 2016. Case rates range from 1.8/100,000 population in American Samoa to 243.9/100,000 in the Republic of the Marshall Islands, compared with the substantially lower overall U.S. case rate (2.9/100,000).

Slide 7. TB Case Rates by Age Group, United States, 1993–2016. During 2016, case rates in all age groups declined by >50% from their 1993 values: persons aged ≥ 65 years, from 17.7 cases/100,000 population in 1993 to 4.6 in 2016; adults aged 45–64 years, from 12.5 to 3.4; adults aged 25–44 years, from 11.6 to 3.3; persons aged 15–24 years, from 5.0 to 2.2; children aged 5 to 14 years, from 1.7 to 0.4; and children aged ≤ 4 years, from 5.2 to 1.1.

Slide 8. Reported TB Cases by Age Group, United States, 2016. Two percent of TB cases were among children aged 0–4 years; 2% were among those aged 5–14 years; 10% were among persons aged 15–24 years; 31% were among adults aged 25–44 years; 31% were among adults aged 45–64 years; and 24% were among adults aged ≥ 65 years.

Slide 9. TB Case Rates by Age Group and Sex, United States, 2016. Case rates tended to increase with age, ranging from <1 case/100,000 children aged 5–14 years to a high of 6.4 cases/100,000 men aged ≥ 65 years. As age increased, the case rate among men increased faster than women; the rates among men aged ≥ 45 years were approximately twice those among women of the same age.

Slide 10. TB Case Rates by Race/Ethnicity, United States, 2003–2016. By race/ethnicity, the rates indicate a declining trend in TB since 2003. Asians consistently had the highest yearly TB rates, but their rates declined from 29.3 cases/100,000 population in 2003 to 18.0 in 2016, a 38.6% decrease. Rates also declined among the following racial/ethnic groups: non-Hispanic blacks/African Americans, from 11.7 in 2003 to 4.9 in 2016 (–58.2%); Hispanics, from 10.2 to 4.5 (–55.8%); non-Hispanic whites, from 1.4 to 0.6 (–57.1%); American Indians and Alaska Natives, from 8.3 to 4.7 (–43.6%); and Native Hawaiian/Other Pacific Islanders, from 15.7 to 13.9 (–11.2%). Because of the low TB case counts and population estimates for Native Hawaiians/Other Pacific Islanders in the United States, case rates for this group might appear high. (Percentage change are based off of unrounded numbers.)

Certain key factors likely contribute to the disproportionate burden of TB among minority groups. For persons who were born in countries where TB is common, TB disease can result from infection acquired in their country of origin. Unequal distribution of TB risk factors (e.g., human immunodeficiency virus [HIV] infection) also might contribute to increased exposure to TB or to an increased risk for experiencing TB after becoming infected with *Mycobacterium tuberculosis*.

Slide 11. TB Case Rates by Age Group and Race/Ethnicity, United States, 2016. After infancy (ages 0–4 years), risk typically increased with age across all racial/ethnic groups, except among Native Hawaiians/Other Pacific Islanders, which did not indicate a trend. Rates were consistently higher among minority racial/ethnic groups than among non-Hispanic whites. Rates were the highest among Asians and Native Hawaiians/Other Pacific Islanders. Because of the low TB case counts and population estimates for Native Hawaiians/Other Pacific Islanders in the United States, case rates for this group might appear high.

Slide 12. Reported TB Cases by Race/Ethnicity, United States, 2016. During 2016, approximately 86% of all reported TB cases occurred among racial/ethnic minorities: Asians, 35%; Hispanics, 28%; non-Hispanic blacks/African Americans, 21%; American Indians/Alaska Natives, 1%; and Native Hawaiians/Other Pacific Islanders, 1%. In contrast, 13% of cases occurred among non-Hispanic whites. Persons reporting two or more races, not including persons

of Hispanic or Latino ethnicity, accounted for 1% of all cases. Unknown or missing data on race accounted for <0.5% of all cases.

Slide 13. Number of TB Cases Among U.S.-Born versus Non-U.S.-Born Persons, United States 1993–2016. The graph illustrates the increase in the percentage of cases occurring among non-U.S.-born persons during the study period, from 30% in 1993 to 69% in 2016. Overall, the number of cases among non-U.S.-born remained stable before 2009, with approximately 7,400–8,000 cases/year. During 2009, the number decreased to 6,999, and that trend continued through 2013, with the number of cases among non-U.S.-born persons decreasing to 6,222. However, in 2014 and 2015 the number of cases among non-U.S.-born persons increased to a high of 6,406 in 2015. In 2016, the number of cases decreased from 2015 to 6,351 cases. Among U.S.-born persons the number of cases decreased from >17,000 in 1993 to 2,901 in 2016.

Slide 14. Trends in TB Cases Among Non-U.S.-Born Persons, United States, 1993–2016. The percentage of TB cases accounted for among non-U.S.-born persons increased from 30% in 1993 to 69% in 2016.

Slide 15. Reported TB Cases by Origin and Race/Ethnicity, United States, 2016. Among U.S.-born persons with TB in 2016, 37% were non-Hispanic black/African American; 31% were non-Hispanic white, 21% were Hispanic/Latino; 5% were Asian; 4% were American Indian/Alaska Native; and 1% were Native Hawaiian/Other Pacific Islander. Persons reporting two or more races totaled <1% of cases among U.S.-born persons. Among non-U.S.-born persons with TB, 48% were Asian; 31% were Hispanic/Latino; 14% were non-Hispanic black/African American; 5% were non-Hispanic white; 1% were Native Hawaiian/Pacific Islander; and 1% were persons reporting two or more races, not including persons of Hispanic/Latino origin. Cases among American Indians/Alaska Natives constituted 0.3% of the cases among non-U.S.-born persons and are not included on the charts.

Slide 16. Percentage of Non-U.S.-Born Persons Among TB Cases, United States, 2006 and 2016. The number of states with <25% of their TB cases occurring among non-U.S.-born persons decreased from 6 states in 2006 to 4 states in 2016. The number of states with ≥25%–49% of cases among non-U.S.-born persons decreased from 16 states and DC in 2006 to 8 states in 2016. However, the number of states that had ≥50% of their cases among non-U.S.-born persons increased from 28 states in 2006 to 38 states and DC in 2016.

Slide 17. TB Case Rates Among U.S.-Born versus Non-U.S.-Born Persons, United States, 1993–2016. TB rates among non-U.S.-born remain higher than those among the U.S.-born population. During 1993–2016, the rate among U.S.-born persons decreased from 7.4 cases/100,000 population to 1.1, whereas the rates among non-U.S.-born persons decreased from 34.0 cases/100,000 population to 14.7.

Slide 18. TB Case Rates Among U.S.-Born versus Non-U.S.-Born Persons, United States, 1993–2016. The chart presents the same data as on Slide 17, but uses a logarithmic scale to better illustrate the trends. The trend lines indicate a greater rate of decrease among U.S.-born, compared with non-U.S.-born, persons during the study period.

Slide 19. Countries of Birth Among Non-U.S.-Born Persons Reported with TB, United States, 2016. The top seven countries are displayed in the chart; those countries have remained relatively constant since 1986, when information regarding country of birth was first reported by

all areas submitting reports to CDC. During 2016, the top seven countries accounted for 60% of all cases among non-U.S.-born persons, with Mexico accounting for 19%; the Philippines, 12%; India, 9%; Vietnam, 8%; China, 6%; Guatemala, 3%; and Haiti, 3%. Persons from 135 other countries each accounted for $\leq 2\%$ of the total, but altogether, accounted for 40% of non-U.S.-born persons reported with TB.

Slide 20. Percentage of Non-U.S.-Born Persons with TB, by Time of Residence in U.S. Before Diagnosis, 2016. The chart indicates that the distribution for the top three countries of birth is Mexico, the Philippines, and India. Among persons born in Mexico, 11.2% had been in the United States for <1 year; 6.5%, 1–4 years; 8.4%, 5–9 years; 22.9%, 10–19 years; and 39.8% for ≥ 20 years. Among persons born in the Philippines, 11.6% had been in the United States for <1 year; 9.9%, 1–4 years; 12.4%, 5–9 years; 21.4%, 10–19 years; and 33.2%, ≥ 20 years. Among persons born in India, 21.1% had been in the United States for <1 year; 26.8%, 1–4 years; 13.2%, 5–9 years; 18.8%, 10–19 years; and 13.8%, ≥ 20 years. Values for unknown length of residence in the United States for these top three countries ranged from 6.3 to 11.5% for 2016. For all other non-U.S.-born persons, 20.4% had been in the United States for <1 year; 17.9%, 1–4 years; 12.9%, 5–9 years; 18.1%, 10–19 years; 22.8%, ≥ 20 years; and 7.9%, unknown length of residence. Overall, 17.6% had been in the United States for <1 year; 15.6%, 1–4 years; 12.0%, 5–9 years; 19.5%, 10–19 years; 26.5%, ≥ 20 years; and 8.8%, unknown length of residence.

Slide 21. Primary Anti-TB Drug Resistance, United States, 1993–2016. The graph starts in 1993, the year in which the individual TB case reports submitted to the national surveillance system began collecting information regarding initial susceptibility test results for patients with culture-positive TB. Data were available for $>86.9\%$ of culture-positive cases for each year. Primary resistance was calculated by using data from persons with no reported prior TB episode. Resistance to at least isoniazid was 8.2% in 1993; however, by 2016, this had increased to 8.7%. Resistance to at least isoniazid and rifampin, known as multidrug-resistant TB (MDR TB), was 2.5% in 1993. The percent of primary MDR TB has remained approximately stable since it decreased to 1.0% in 1998. In 2016 the percent of primary MDR TB was 1.2%.

Slide 22. Primary MDR-TB, United States, 1993–2016. This graph focuses on trends in primary multidrug-resistant TB (MDR-TB), which is based on initial isolates from persons with no prior history of TB. The number of primary MDR-TB cases, represented by the bars, decreased steadily from 407 in 1993 to 115 in 2001, with a slight increase to 132 in 2002. Since then, the total number of primary MDR-TB cases has fluctuated from 70 to 103 cases, with 78 cases reported for 2016. Primary MDR-TB, indicated by the trend line, decreased from 2.5% in 1993 to approximately 1.0% in 1998, and has fluctuated approximately 1.0% since then. During 2016, the percentage was 1.2%.

Slide 23. Primary Isoniazid Resistance Among U.S.-Born versus Non-U.S.-Born Persons, United States, 1993–2016. On the basis of initial isolates from persons with no prior history of TB, the percentage of isoniazid resistance has remained higher among non-U.S.-born persons than among U.S.-born persons for all years measured. Among non-U.S.-born persons, the percentage declined from 12.1% in 1993 to 10.0% in 2016. In U.S.-born persons, the percentage decreased from 6.7% in 1993 to a low of 4.2% in 2007. From 2008 to 2016 the percentage of

cases ranged from 5.2% in 2008 to a high of 7.5% in 2014. During 2016, the percentage of primary isoniazid resistance among U.S.-born cases was 5.9%.

Slide 24. Primary MDR-TB in U.S.-born vs. Non-U.S.-born Persons, United States, 1993–2016. This graph highlights primary MDR-TB in U.S.-born versus non-U.S.-born persons. The percentage with primary MDR-TB has declined among both groups since 1993, although the decline in the U.S.-born has been greater. As a result, the proportion of primary MDR-TB cases in the US that are attributed to non-U.S.-born persons increased from approximately 25% in 1993 to 90% in 2016 (not shown on slide). Among the U.S.-born, the percentage with primary MDR-TB has been less than 1% since 1997 and was 0.4% in 2016. The percentage among non-U.S.-born persons has fluctuated year by year, although it has remained between 1.2 and 1.8% since 1995. In 2016 the percentage of primary MDR-TB among non-U.S.-born persons was 1.5%.

Slide 25. XDR-TB Case Count, Defined on Initial DST, United States, 1993–2016.

Extensively drug-resistant TB (XDR-TB) at first drug susceptibility test (DST) is defined as resistance to isoniazid and rifampin, plus resistance to any fluoroquinolone and at least one of three injectable second-line anti-TB drugs. One case of XDR-TB was reported in 2016, and the most reported in a single year was 10 in 1993. No cases were reported in 2003 and 2009, and no apparent trend exists in the number of cases over time.

Slide 26. Reporting of HIV Test Results in Persons with TB by Age Group, United States, 1993–2016. This slide shows the completeness of reporting of HIV test results in persons with TB by age group from 1993 through 2016. The percentage of TB patients for whom test results were reported increased from 30% among all ages in 1993 to 90% in 2016. Among adults 25–44 years of age, the percentage increased from 45% in 1993 to 95% in 2016. California began reporting HIV test results to CDC in 2011; this accounts for the substantial percentage increase for that year.

Slide 27. Estimated HIV Coinfection in Persons Reported with TB, United States, 1993–2016. This slide provides minimum estimates of HIV coinfection among persons reported with TB from 1993 through 2016. Since the addition of the request for HIV status to the individual TB case report in 1993, incomplete reporting has provided a challenge to calculating reliable estimates, although reporting improved substantially beginning in 2011 (see previous Slide 26). Results from the cross-matching of TB and AIDS registries have been used to supplement reported HIV test results. For all ages, the estimated percentage of HIV coinfection in persons who reported HIV testing (positive, negative, or indeterminate test results) with TB decreased from 48% to 6% overall from 1993–2016, and from 63% to 9% among persons 25 to 44 years of age during this period.

Slide 28. TB Cases by Residence in Correctional Facilities, Age ≥15, United States, 1993–2016. This graph highlights the number of cases that were a resident of any type of correctional facility at the time of TB diagnosis. Cases must have been 15 years of age or greater. The number of cases residing in a correctional facility has decreased from a high of 1,117 cases in 1994 to 328 cases in 2016. Between the years 2000 and 2010, the number of cases residing in a correctional facility ranged between the mid to high-400s and high-500s; 2011 was the first year to drop below this range to 423 cases. Of total cases, the percentage of cases residing in a correctional

facility has ranged from 5.0% in 1994 to 3.3% in 2002. The 1990s saw a decreasing trend in percentage until 2002. Since 2002, there has been an increasing trend in percentage. In 2016 percentage of total cases was 3.7%.

Slide 29. TB Cases by Homeless Status, Age ≥ 15 , United States, 1993–2016. This graph highlights the status of cases that were homeless within twelve months prior of TB diagnosis from 1993 through 2016. Cases must have been 15 years of age or greater. The number of homeless cases has decreased from a high of 1,379 cases in 1994 to 430 in 2016. This category has seen an overall decrease in cases since 1994, with the exception of the slight increases observed in years 2003, 2006, and 2010. Of total cases, the percentages of homeless have had an overall decline from 7.5% in 1993 to 4.9% in 2016.

Slide 30. Mode of Treatment Administration in Persons Reported with TB, United States, 1993–2014. In 1993, the reporting areas began providing information about mode of treatment administration on the individual TB case report form. Treatment administered as only directly observed therapy (DOT) increased from 21.7% in 1993 to 63.9% in 2014, the latest year with available data. The proportion of patients who received at least some portion of their treatment as DOT (based on combining the percentage of patients who received only DOT and the percentage for whom some portion was self-administered) was 29.0% in 2014.

Slide 31. Completion of TB Therapy, United States, 1993–2014. The reporting areas began providing information on completion of therapy in 1993 through the individual TB case report form. The calculations exclude persons with initial isolate rifampin resistant, or patient with bone and joint disease, meningial disease or disease of the central nervous system, or pediatric patient (age <15) with miliary disease or positive blood culture or a positive nucleic acid amplification test on a blood specimen, and those who moved out of the country within one year of initiating treatment. Overall completion of therapy had remained at approximately 92-93% from 1998 through 2008, but increased to 95-97% from 2009 to 2014. In 2014, the latest year with available data, completion of therapy was 97%. Completion in 1 year or less increased from 63% in 1993 to 90% in 2014. The current DHHS Healthy People 2020 objective is completion of therapy in 1 year or less in 93% of patients. CDC is working with state and local health departments to determine and evaluate reasons for apparently delayed completion of therapy, which may vary by jurisdiction.

Slide 32. Definition for Tuberculosis Genotyping in the United States. This slide shows the schematic for sequential assignment of unique spoligotypes and initial 12-locus MIRU-VNTR combination or 24-locus MIRU-VNTR combination.

Slide 33. National Tuberculosis Genotyping Surveillance Coverage by Year, United States, 2004–2016. This slide shows the increase in genotyping surveillance coverage from 2004 to 2016. In 2004 the proportion of positive cultures with at least one genotyped isolate was 52.6%; in 2016 it was 96.4%. The national goal for genotyping surveillance coverage is 94.0%.

Slide 34. Number of County-based Tuberculosis Genotype Clusters by Cluster Size, United States, 2014–2016. This slide shows the number of county-based TB genotype clusters by the size of the clusters; genotype cluster is defined as two or more cases with matching spoligotype

and 24-locus MIRU-VNTR (GENType) within a county during the specified three year time period. In the 2014–2016 three year time period, there were 878 two-case clusters, 263 three-case clusters, 105 four-case clusters, 43 five-case clusters, 25 six-case clusters, 26 seven-case clusters, 14 eight-case clusters, 10 nine-case clusters, and 37 case clusters that were greater or equal to 10 in size.

Slide 35. Tuberculosis Genotype Clusters by TB GIMS Alert Levels, United States, 2014–2016. This slide shows a chart with percentage of genotype clusters by alert level. Alert level is determined by the log likelihood ratio statistic (LLR) for a given cluster, identifying higher than expected geospatial concentrations for a TB genotype cluster in a specific county, compared to the national distribution of that genotype; TB GIMS generates alert level notifications based on this statistic: “No alert” is indicated if LLR is between $0 < LLR < 5$, “medium” is for LLR of $5 < LLR < 10$ and “high” alert is for clusters with $LLR \geq 10$. In the 2014–2016 three year time period, high alerts made up 6% of the total, medium alerts were 23%, and no alert were 71%.

Slide 36. (final slide). For more information, please contact Division of Tuberculosis Elimination at <http://www.cdc.gov/tb/>.